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Fuelwood From Southern Hardwoods:

An Opportunity For Improved Forest Management

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FUELWOOD FROM SOUTHERN HARDWOODS: AN OPPORTUNITY FOR IMPROVED FOREST MANAGEMENT

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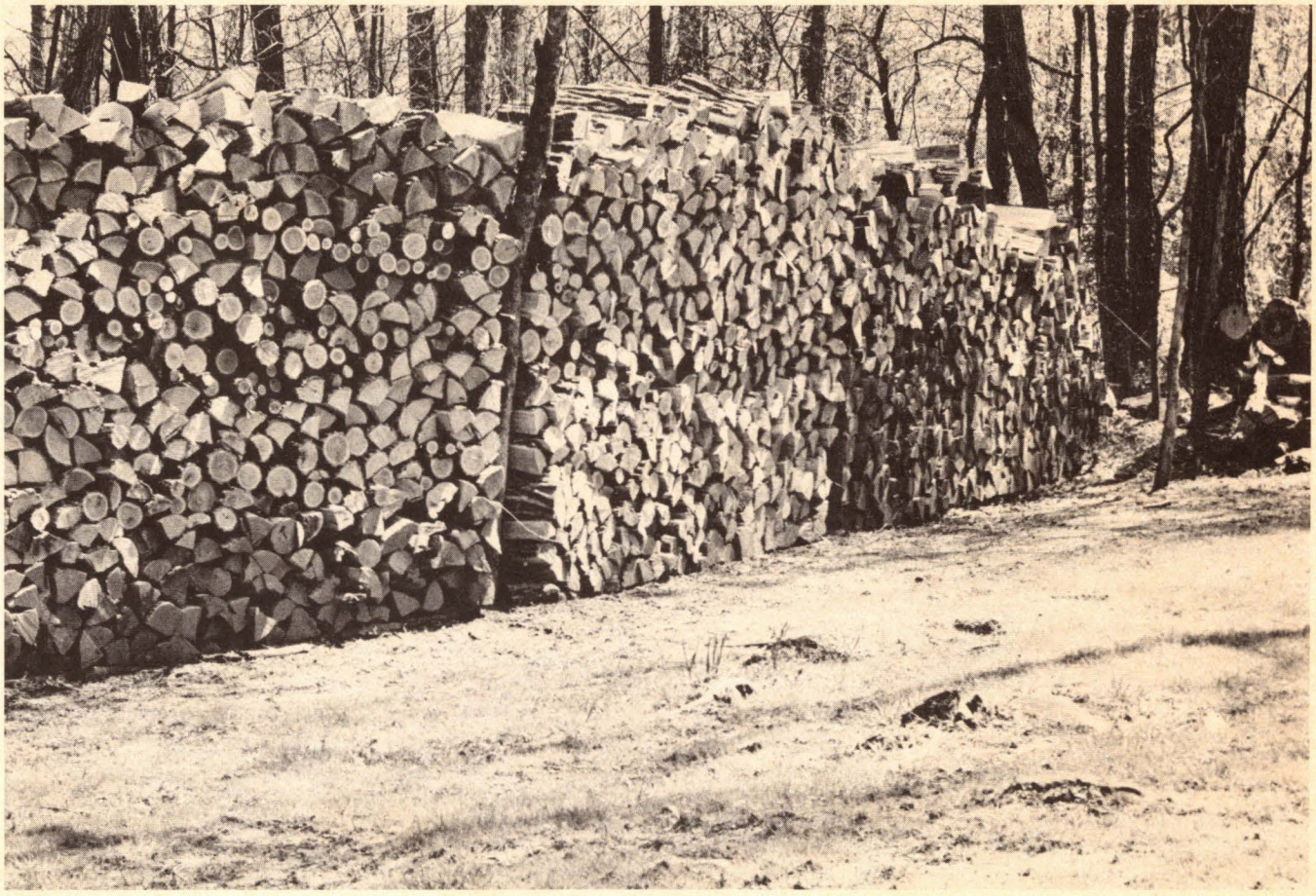

SUMMARY

Improved woodland management results in economic advantages through the use of wood from thinnings, cull removal, release, site preparation and salvage operations. The primary aim of this bulletin is to demonstrate how the woodland owner can improve the condition of wood lots while providing wood for home use or for sale.

INTRODUCTION

A century ago, wood provided three-fourths of the fuel and heat requirements of the United States. During the last 50 years, both our energy needs and our consumption of the more convenient fossil fuels, particularly oil and natural gas, have soared. In the process, the use of wood as a source of heat and energy had been reduced to about 1 percent of our total energy consumption.

Trees are a renewable natural resource that can be harvested periodically without causing permanent disruption to the environment. This advantage, coupled with the sharply spiraling costs, dwindling supplies, and pollution concerns associated with fossil fuels, may provide an opportunity for wood to regain some of its historical importance as an energy source. Such a change could be especially significant in regions that have abundant supplies of suitable species readily available to meet the growing demand for fuel wood.

The use of wood as a fuel in the South presents an opportunity for consumers and landowners alike. First, wood can be used as an alternative energy source to help offset the impending shortages and escalating costs of other fuels. Second, the use of trees for fuel creates an opportunity to improve the condition of timber stands through needed cuttings.

One of the most discussed forest management problems in the South today is the overabundance of small, poor quality, and generally undesirable hardwoods occupying otherwise productive sites. Little or no market opportunities exist for most of these trees. When other markets are lacking, the opportunity exists to use, or sell these trees, and improve the quality of forest management under a variety of conditions through fuel wood cuttings.

THINNING AND TIMBER STAND IMPROVEMENT IN HARDWOOD STANDS

Of primary importance in the management of hardwood stands is the maintenance of an optimum growth rate on the most desirable trees in fully stocked stands. The best way to assure such growth is by frequent light thinnings that begin at an early age. Thinning is not usually practical until about age 20, when the trees have reached poletimber size. By this time, the more vigorous trees are in a dominant position. While these stands will respond better than older ones, stands up to 60-80 years of age will usually benefit from thinning. However, in most cases these thinnings from older stands will be worth more as sawlogs. See figure 1.

Before thinning, the best trees in the stands should be marked as "crop" trees and protected, as they will develop into the most valuable portion of the stand. Those trees which compete with these young "crop" trees should be cut for firewood.

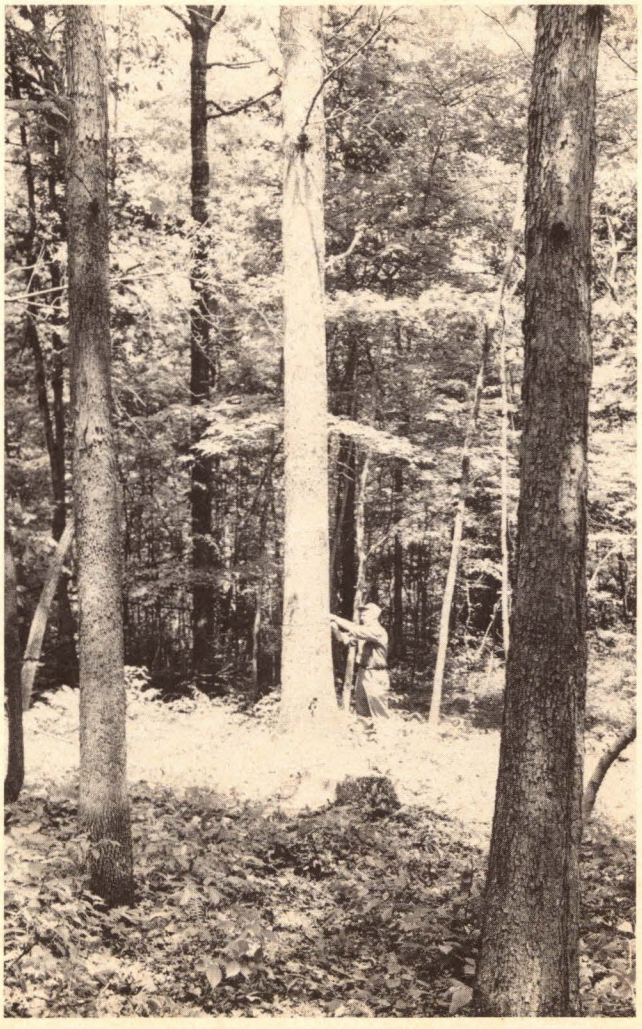

Figure 1.–Growing conditions for young hardwood stands can be improved while providing firewood through thinnings and Timber Stand Improvement (TSI).

CROP TREE SELECTION

Crop trees should be desirable species of high vigor and quality potential that will be favored throughout the life of the stand and will form the major portion of the stand at maturity. Select and identify crop trees as follows:

Species.–Species selection may be influenced to some extent by a landowner's interests apart from timber (for example, certain trees may be desired as wildlife den trees rather than for their timber value). However, because these trees will not usually dominate the stand, species selection will be concentrated on high-value timber trees. By the time a stand reaches poletimber size, trees capable of maintaining a dominant position in the stand are already dominant. Usually, in young, even-aged stands, many of the more valuable shade-intolerant species will hold this dominant position, and the main emphasis in crop tree selection should be on these trees. Some of the more valuable species include yellow-poplar, ash, gum, black walnut, cherry, oak and hickory.

Crown class.–Provided they represent desirable species, those trees with live crowns in the dominant and co-dominant crown classes would be favored as crop trees.

Bole quality.–The following quality factors should be considered when selecting crop trees:

A. Clear bole length.–This may be described as the distance to the nearest live limb larger than 0.5 inch (1.27 cm) in diameter, or the first fork in the main stem. Favor trees with the highest clear bole length.
B. Straightness.–Avoid trees with excessive sweep or crook.
C. Natural pruning ability.–Favor trees with small branch diameters, and avoid leaving those which show a tendency for epicormic branching (shoots that sprout along the branches or trunk).
D. Health and vigor.–Give priority to trees that are free of insect, disease, fire and mechanical stem damage.

Once crop trees have been selected and identified, they should be released by removing less desirable trees that compete with the upper two-thirds of the crop tree's live top (crown). Openings created around the crop trees fill in quickly once trees respond to release. Removing one or two competing trees is usually sufficient, but do not hesitate to remove more, if necessary. Dead, dying, or deformed trees are also suitable as fuel and can be removed along with the direct competitors. Small trees and those which do not directly compete with the crowns of crop trees should be left to act as trainers that promote natural pruning on crop trees.

Years of poor cutting practices, wildfire, and general neglect have left many hardwood stands with a large number of older, cull trees. While some cull trees may be desirable for wildlife or other reasons, they should not dominate the stand. If the stand still contains an adequate number of desirable trees, a timber stand improvement (TSI) cut would remove many of the unwanted trees. The result would be an improvement in the quality of the stand and another opportunity to harvest firewood. The most valuable crop trees should be selected and direct competitors and culls should be cut for firewood, providing they are not marketable for products of higher value. Firewood cutting in these stands should remove dead, dying, diseased or insect-infested trees along with poorly formed, low quality trees. More growing space for the desirable trees is then available in the present stand.

SPACING AND DISTRIBUTION.

Select and mark crop trees before entering a stand to cut firewood. Recommended crop trees per acre by size classes are:

Size Class	*Dbh* (inches)*	*Optimum number crop trees/acre*	*Approximate spacing (feet)*
Poletimber	4-10	100-120	20 x 20
Small sawlogs	11-16	70-90	24 x 24
Large sawlogs	17-24+	30-40	35 x 35

*Dbh is the diameter of the trunk at breast height (4½ feet above the ground).

Note: This table represents optimum stocking conditions. The same procedure may also be feasible on stands with fewer crop trees.

Contact your local service forester or consultant for assistance in selecting crop trees and deciding which trees should be removed from the stand. Your State forestry agency can furnish the names and locations of these foresters upon request.

REGENERATING HARDWOOD STANDS

Where hardwood stands have reached economic maturity or where they are badly degraded because of past cutting practices, fire, or other external factors, regeneration may be the best management practice. This usually means a final harvest cut followed by site preparation which removes all residual trees down to 2 inches (5 cm) in diameter at 4½ feet (137 cm) above ground. Enough light and growing space will then be available for natural regeneration. A firewood cutting has the advantage of using trees that would otherwise be wasted, and reduces site preparation costs. Where sprouts will be relied upon as a part of the new stand, trees of desirable species should be cut with stumps as low as possible to reduce the risk of butt rot. (Where practical, stumps should be no higher than 4 inches [10 cm] above ground.) Another bonus in some of these stands will be logging residues, including limbs and tops left in the woods after logging. See figure 2.

TIMBER STAND IMPROVEMENT AND REGENERATION ON PINE SITES

TSI goals in pine stands go hand in hand with opportunities to make greater use of wood for fuel. Cull hardwood invasion of pine sites is probably the most prevalent problem in keeping these sites, and the species for which they are best suited, fully productive. Low grade hardwoods compete with pine for growing space in many sapling, poletimber, and small sawtimber stands. Low quality hardwood stands now occupy thousands of

Figure 2.–When hardwood stands are ready for regeneration, residual trees, limbs and tops, left after the more valuable products are removed, can be used for firewood.

cutover acres that formerly supported valuable pine stands. (An estimated 30 million [12.14 million ha] across the South, now classified as hardwood, would be more productive if growing pine.) Some of these areas include small drainages as well as other sites better suited to producing hardwoods and other resource needs that should be identified and managed for hardwood. With these exceptions, removing competing hardwoods becomes a continuing management goal in pine stands. This makes firewood cutting a desirable practice for eliminating hardwoods competing with the more desirable pine, and for removing cull hardwoods before pine regeneration. See figure 3. Local service foresters or consultants will help identify sites, assess their potential, and prescribe treatment.

Figure 3.–Removal of unwanted hardwoods from pine sites is another firewood prospect.

Other possibilities for fuelwood harvest include salvage operations in stands that have been damaged or killed by fire, insects, diseases, storms, or other causes.

UNITS OF MEASURE

Firewood volume is usually measured by the cord. A standard cord contains 128 cubic feet (3.6 m^3) of volume, including wood, bark, and air spaces. A cord is generally defined as a stack of wood 8 feet wide, 4 feet high, and 4 feet deep (2.4 x 1.2 x 1.2 m) (see figure 4).

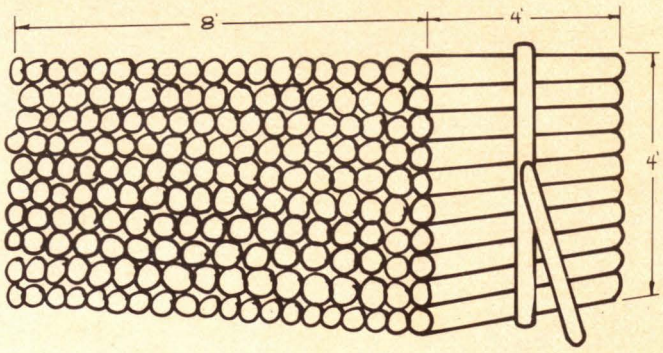

Figure 4.–Dimensions of a standard cord of firewood.

Generally speaking, however, 4-foot (1.2 m) logs are too long for home use, and most firewood is therefore cut in lengths from 16 to 24 inches (40.6 to 61 cm). Wood sold in lengths shorter than 4 feet, but still closely stacked in a pile 8 feet wide by 4 feet high, would be considered a *face cord.* A formula can be used to determine what percentage a face cord is of a standard cord. First, neatly stack the wood, then multiply the width of the pile by the height. Multiply this figure by the length of the logs in feet and divide by 128. For example, a pile is 8 feet wide by 4 feet high and the length of the logs is 2 feet then:

$8 \times 4 \times 2 = 64 \div 128 = .50$ or your face cord would be one-half of a standard cord.

FUEL VALUES FOR SOUTHERN SPECIES

Relative fuel values (Btu) for several of the more common southern species are shown in table 1. These values are based on the average weight of a standard cord of each species, and assumes a value of 8,600 Btu per pound of oven-dry wood. High heat values per cord do not depend on the wood's moisture content except through the shrinkage of wood as it dries. This rating does not take into account other values associated with firewood quality, such as cutting and splitting characteristics, aroma, and ease of starting a fire. (The values are from the Forest Products Laboratory's *Wood Handbook,* Tables 3-3 and 4-2.)

Table 1.–Fuel values of wood from southern trees

Species	High heat value/standard cord (million Btu)	Species	High heat value/standard cord (million Btu)
Oak, live	38.2	Walnut, black	23.6
Hickories	30.8-32.1	Maple, red	23.2
Oak; willow, swamp white	29.6-30.8	Sweetgum	22.3
Honeylocust	29.6	Hackberry	22.1
Oak: post, scarlet,swamp chestnut	28.7	Pine; loblolly, shortleaf	21.8
Oak; cherrybark, chestnut, southern red, white	28.3	Cherry, black	21.4
Pecan	28.3	Elm, American	21.4
Locust, black	28.3	Magnolia, southern	21.4
Oak; northern red, overcup, water	27.0	Sycamore	21.0
Elm, rock	27.0	Yellow-poplar	18.0
Maple, sugar	27.0	Sassafras	17.5
Oak, black	26.1	Cottonwood	17.1
Ash, white	25.7	Hemlock	17.1
Pine; longleaf, slash	25.3	Willow, black	16.7
Ash, green	24.0	Pine, white	15.0

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CHEVROLET